INSTRUCTION I-108-1

OPERATION and MAINTENANCE MANUAL

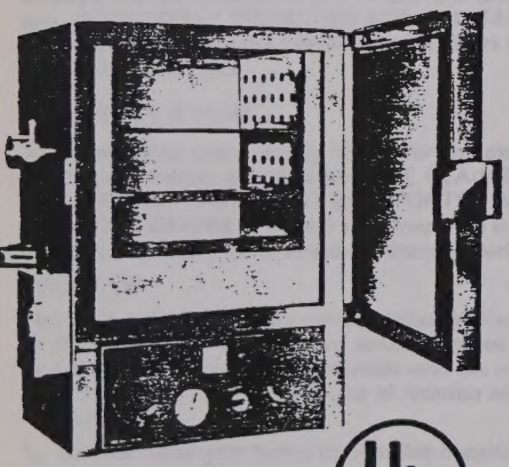
BLUE M

HIGH POWERED LIFE-TEST OVEN

With

POWER-O-MATIC-70® PATENTED

SOLID-STATE PROPORTIONING CONTROL SYSTEM & BUILT-IN OVERTEMPERATURE PROTECTION



UL E 30112

Model ESP-400BC-4

BLUE M

BLUE M Electric Company

CORPORATE HEADQUARTERS: BLUE ISLAND, ILLINOIS 60406

BLUE M

HIGH POWERED LIFE-TEST OVEN

Mechanical Convection
Horizontal Air-Flow

Model ESP-400BC-4

TEMPERATURE RANGE:
+38°C. to +260°C. (500°F)
HEAT: 4.2 kw 240 Volt/1 Ph/60 Hz.
3.2 kw 208 Volt/1 Ph/60 Hz.
LINE CURRENT: 18 Amps at 240 V.
16 Amps at 208 V.
NET WEIGHT: 155 lbs.

INTRODUCTION

Blue M Ovens are manufactured to the highest standards of the industry and are designed to give reliable and satisfactory service, IF PROPERLY INSTALLED AND MAINTAINED. Complying with the following instructions will assure long life and trouble-free operation.

I. INSTALLATION

After unpacking oven, visually inspect for any damage caused by improper handling in shipment. ALL CLAIMS FOR DAMAGE OR SHORTAGES MUST BE REPORTED IMMEDIATELY TO THE CARRIER. We will assist you if we are contacted. Please do not return goods without written authority.

LOCATION

This oven will automatically control various temperatures within close tolerances for extended periods without adjustment. In order to produce results compatible with the oven's capabilities, reasonable care in the choice of location will have to be exercised.

1. Do not install near highly combustible materials.
2. Do not locate in an area subjected to extremely wide ambient temperature variations, i.e., near outside entrances, windows, building heating and/or air conditioning vents.
3. Sufficient clearance (1 foot) must be allowed around entire perimeter of oven to facilitate air circulation and safety. (U.L. requirement).
4. Area above oven will be subjected to higher than normal ambient temperatures. Make certain that anything in this area will be able to function properly under these circumstances.
5. Standard ovens **must not be "stacked."** Contact factory for information on stacking.

POWER CONNECTION TO MAIN FUSED DISCONNECT SWITCH

Connect to power source of voltage and frequency specified on data plate. For safety, do not replace fuses supplied with higher value fuses.

OVEN MUST BE GROUNDED. Connect a suitable wire from the oven proper to a good electrical ground.

Do not connect the oven to already overloaded power lines. A 10% drop in the specified input voltage decreases heating power by 19%. A 20% drop will decrease heating power by 36%.

II. CONTROL EQUIPMENT

POWER-O-MATIC 70 TEMPERATURE CONTROL (Patented)

The POWER-O-MATIC 70 Solid State Proportioning Control System is an advanced compact and reliable device. It provides extremely accurate, infinitely proportional straight line control. Overall performance is comparable to costly temperature regulating equipment selling for hundreds of dollars more.

The POWER-O-MATIC 70 provides a control tolerance of ±0.2°C. and rapid response to temperature changes.

During run-up to setpoint temperature, the POWER-O-MATIC 70 allows full power to be applied to the heating element. Approximately 5°C. below setpoint temperature, the power applied to the heating elements will gradually start reducing. At setpoint temperature, only sufficient power to offset the natural heat losses of the chamber is applied. This proportioning feature provides truly straight line temperature control.

PANEL VOLTMETER

The panel voltmeter is connected across the heating element. It indicates percentage of available voltage actually being applied to the heating elements.

MAIN PILOT LIGHT

Indicates that main switch is in "On" position. It will not light unless OTP is set.

MAIN SWITCH

Turns oven "On" or "Off".

OVERTEMPERATURE PROTECTION (OTP)

The Overtemperature Protection Control (OTP) provides added safety for the oven and workload. Normal practice is to set OTP control approximately 10°C. higher than setpoint temperature. If for any reason, oven temperature rises 10°C. above setpoint temperature, the OTP will shut oven off. As the oven cools, the OTP will restart the unit, cycling one or more times depending on the adjustment of the time delay resistor. If oven overheats repeatedly, OTP reset device will trip, shutting off oven completely. Refer to Section VIII for time delay adjustment. To reset OTP, merely press button marked "Reset".

FUSED DISCONNECT SWITCH

For safety, protects unit in case of shorts of control failure.

READY READ TEMPERATURE INDICATOR

3½" diameter. Stainless steel sensing bulb. Dual scale in degrees C and F.
Refer to instruction sheet I-202-4.

ELAPSED TIME METER

Indicates total time unit is operating. Non-resetting.

PROGRAM TIMERS (optional)

Allows programming of "on time" and "off time" of oven. The Timer Motor Switch turns timer motor off. Setting the timer in an "on" position and turning the Timer Motor Switch "off" allows uninterrupted operation of oven.

Refer to instructions inside Timer Door for additional instructions on use of Timer.

III. OPERATION AND CALIBRATION OF BLUE M MEMORY RING® DIAL SYSTEM

Blue M's patented Memory Ring Dial System is supplied with many Blue M temperature control systems. The Memory Ring allows accurate and repeatable temperature settings throughout range of unit. All dials are factory calibrated to commercially acceptable standards.

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NOTE: This is a dual scale dial. Care must be taken to read the correct scale when selecting operating temperature.

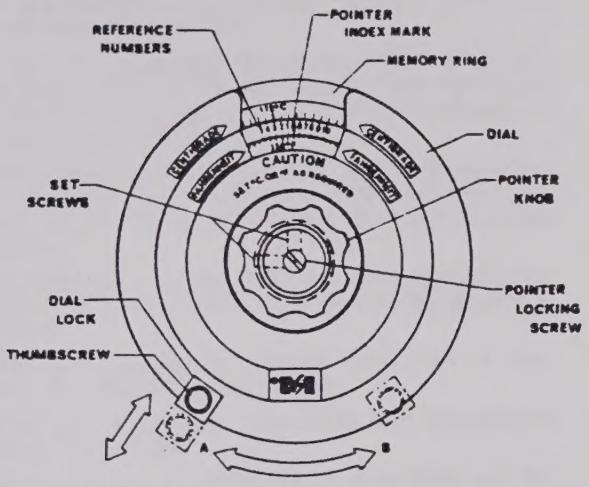


Figure 1

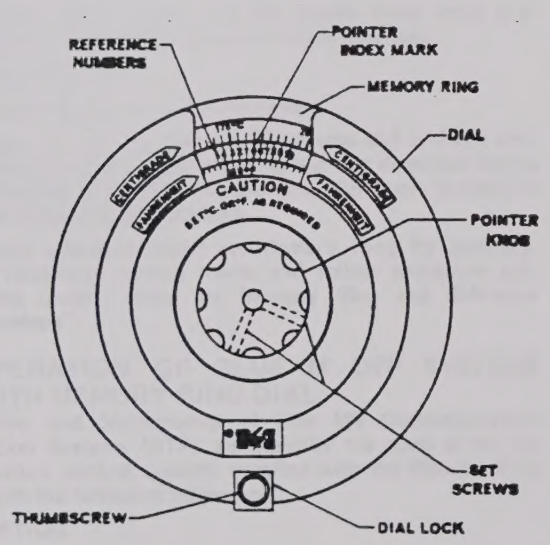


Figure 2

IV. USING THE MEMORY RING AND REFERENCE NUMBERS:

1. Turn unit ON according to basic unit instructions.
2. Unlock dial (refer to Dial Lock Section), and rotate knob until pointer index mark is aligned with desired temperature, +175°C. in this case. Refer to figures 1 and 2.
3. Allow unit to stabilize (approximately 1 hour without temperature change, as measured by an independent temperature indicator of known accuracy).
4. If temperature measured within chamber does not agree with dial setting, rotate pointer knob slightly in desired direction to bring unit to required temperature..

NOTE: Rotate knob CLOCKWISE to INCREASE temperature; rotate COUNTERCLOCKWISE to DECREASE temperature.

5. Allow unit to stabilize (approximately 15 minutes).
6. Repeat steps 4 and 5 until unit stabilizes at exactly +175°C.
7. Note which reference number is lined up with +175°C. Assume that the number 3 lines up in this example. Refer to figure 3.

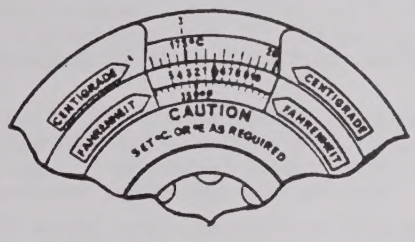


Figure 3

8. Using a pencil or ball-point pen, make a small mark on Memory Ring above +175°C. mark, and write correction number "3" above mark.
9. In future, when control is turned to +175°C., the correction number 3 will appear in pointer window. It will coincide with number 3 on dial pointer and indicate proper setting for +175°C.
10. All temperatures may be calibrated in the same manner. The dial may be calibrated in normal use by marking a correction number when proper temperature is reached.

NOTE: If any desired temperature setting cannot be accommodated in pointer window, recalibration of control dial may be required.

DIAL LOCKS: There are two dial locks utilized on Blue M temperature control units. One is fixed below the center of dial, figure 2, and one has a two position dial lock as shown in figure 1. The movable lock allows 370° rotation of dial.

To lock dial with two position lock, swing it as far to the left or right as possible and push it up towards center of dial until dial is engaged. Tighten thumbscrew to hold dial in position. When thumbscrew is released, lock will fall away from dial.

To engage fixed lock as shown in figure 2, turn thumbscrew clockwise to lock dial; counterclockwise to release it.

RELCALIBRATING CONTROL DIALS

Recalibration should only be necessary after replacing a component in control systems, after extended heavy usage, or if desired temperature cannot be accommodated within pointer window. ALWAYS use an independent temperature indicator of known accuracy when recalibrating dial.

To recalibrate control unit with movable lock, (also identifiable by screw in the middle of the pointer knob), proceed as follows:

1. With unit operating, set pointer index mark to some mid-scale temperature.
2. Lock dial securely.
3. Allow unit to stabilize (approximately 1 hour without temperature change).
4. Loosen the pointer locking screw in center of knob, and loosen two knob set screws (see Figure 1). Loosen dial lock. Dial should now rotate independently of the knob and shaft. Note: it may be necessary to pull knob forward slightly to free dial.

5. Turn dial to align pointer index mark with actual temperature within chamber.
6. Tighten dial lock.
7. While holding pointer knob firmly, tighten pointer locking screw, then two set screws.
8. Allow unit to operate 15 minutes, and re-check temperature to be sure that setting was not disturbed during calibration. If setting was changed, allow unit to stabilize and repeat entire procedure.
9. Check reference marks on Memory Ring for accuracy. If necessary, remove marks and follow procedure outlined under "Using the Memory Ring and Reference Numbers."

To recalibrate unit with fixed lock (also identifiable by lack of a screw in center of pointer knob), proceed as follows:

1. With unit operating, set pointer index mark to some mid-scale temperature, and lock dial.
2. Allow unit to stabilize (approximately 1 hour without temperature change.)
3. Loosen set screws sufficiently to allow knob and dial to rotate independently of shaft.
4. Loosen dial lock.
5. Rotate dial on shaft until the pointer index mark is aligned with actual temperature within chamber.
6. Tighten dial lock.
7. Tighten set screws in pointer knob.
8. Allow the unit to operate 15 minutes and re-check temperature to be sure that setting was not disturbed during calibration. If setting was changed, allow unit to stabilize and repeat entire procedure.
9. Check reference marks on Memory Ring for accuracy. If necessary, remove marks and follow procedure outlined under "Using the Memory Ring and Reference Numbers".

V. OPERATION OF BLUE M OTP SYSTEMS WITH MEMORY RING DIAL

Operation and Maintenance of Blue M's Overtemperature Protection Systems (OTP) are basically the same as for the temperature control systems supplied with the Memory Ring Dial, with the following differences:

OPERATION

1. With the unit operating, loosen the dial lock (see figure 1).
2. Set the OTP control index pointer to a point approximately 5° to 10°C. (10° to 20°F.) above the desired operating temperature.
3. If "Control Failure" light glows, press reset button.
4. Unit will not operate, with OTP shutting down the unit in the event of an over temperature condition.

Calibration of the unit is the same as that of the temperature control systems, with the following differences:

1. Loosen the dial lock and turn OTP control knob fully clockwise; operate unit until it stabilizes at desired temperature, +175°C., in this case. (see figure 1).
2. Turn OTP control down (counterclockwise) until the OTP trips and shuts down unit, sounding buzzer.
3. Observe the reference number that is lined up with +175°C., and proceed by following the instructions outlined in "Using the Memory Ring and Reference Numbers" section of this manual, starting with number 7.

VI. OPERATION

1. Turn on Main Switch.
2. Set OTP control approximately 10°C. (18°F.) above the desired operating temperature and press "reset button". The red main pilot light should now be on.
3. Set required setpoint temperature on main control. Refer to page 3 for use of Memory Ring and reference numbers.

The unit should now be operating.

4. Periodically the OTP control should be turned to the existing oven temperature, deliberately tripping the OTP and verifying its operation. If the OTP does not trip at the proper temperature, recalibrate the control as described in Section IV.
5. Blower motor is energized when main switch is turned on. It is equipped with built in overload protection with an automatic reset. If temperature exceeds motor rating, overload protection automatically stops the motor.

   NOTE: The motors used in these units are lubricated by the manufacturer. This lubrication is sufficient for approximately 10 years of normal operation.

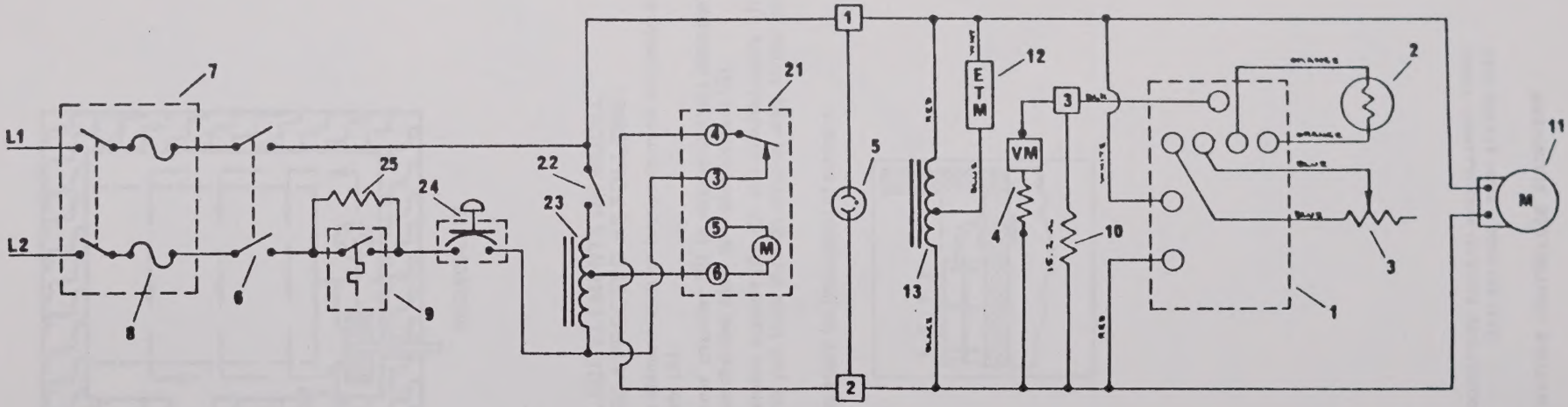
VII. BLUE M "ONE PASS" AIR FLOW SYSTEM

This oven is supplied with one pass air flow and has an air intake, air exhaust and recirculating damper installed in the L.H. side. The purpose of this system is to allow oven to operate at low temperatures or exhaust fumes and volatiles from oven interior. With the damper in the full exhaust position, air enters intake port, passes over heaters, enters oven interior and is exhausted, causing volatile fumes to be exhausted without coming in contact with the heating element(s).

Damper is manually adjustable from the intake port and may be set to full exhaust, recirculate or any position in between.

Dampers should be closed (recirculate) for best results during most heating and baking operations for best temperature uniformity and for the most economical method of operation since with the dampers closed, heat loss and run-up time is minimized, and achieving maximum temperature is assured. However, there are four (4) circumstances when it is desirable to open intake and/or exhaust dampers.

1. Removal of exhaust vapors which result from heating processes. Exhausting vapors will promote faster drying and can be used to eliminate noxious or volatile fumes from the oven. In such cases, venting into a forced exhaust system is desirable. WARNING: VOLATILE VAPORS MUST BE HANDLED WITH EXTREME CAUTION. VENTING OF VAPORS DOES NOT CONVERT A STANDARD MODEL OVEN INTO A HAZARD-SAFE DEVICE. For further information contact factory.
2. Operating near ambient temperature. Air friction caused by the blower wheel circulating the air within the chamber generates heat which, at low temperature, may increase oven temperature above the desired point. This can be minimized by opening both intake and exhaust damper to prevent heat build-up from the blower.
3. Provide regulated cool down. In some applications it is desireable to cool the material in the oven gradually to prevent excessive heat shock. To do this, turn temperature control down to its minimum setting and open the intake and exhaust dampers to produce the desired rate of cool down.
4. For making electrical, hydraulic, or other connections to a load during the heating process. A separate access port is the recommended procedure. Exhaust and intake ports can be used for connections if care is taken that connections will not interfere with normal operation of blower wheel, interior baffles, dampers, heating elements or other components of the oven.



WIRING DIAGRAM

REPLACEMENT PARTS LIST

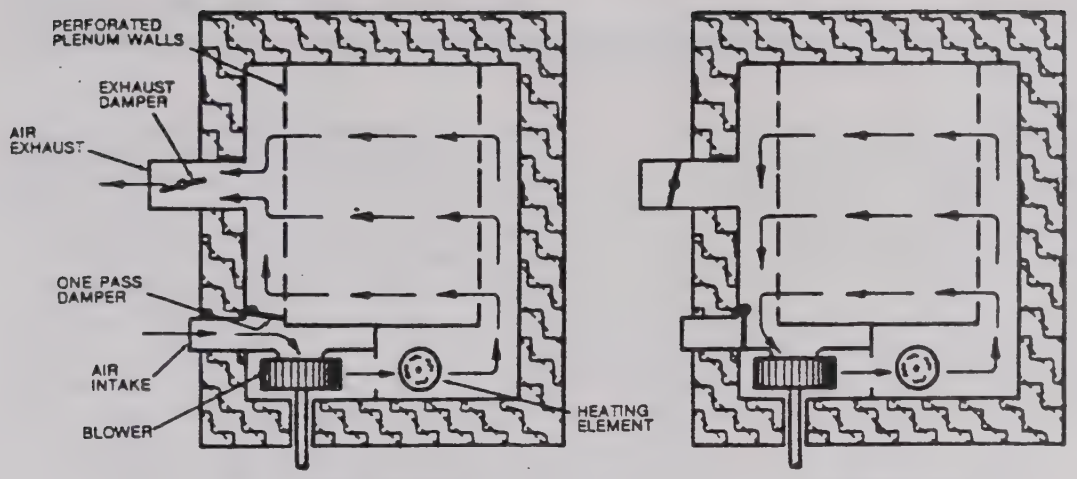
ITEM	DESCRIPTION	PART NUMBER	QTY.
1	POM-70 Temperature Control	CO3B-3-11	1
2	Temperature Sensor	C11D-4-1	1
3	Setpoint Potentiometer	C16A-1	1
4	Voltmeter with Resistor	E09-3	1
5	Red Pilot Light	E06B-2	1
6	Main Toggle Switch	E16A-1	1
7	Fused Disconnect Switch	E16G-10	1
8	25 Amp Fuse	E04C-25	2
9	Overtemperature Protection Control	CO3A-6-3	1
10	Heating Element	H4-105-8¾	1
11	Blower Motor	E10A-2-5	1
12	Elapsed Time Meter	C12G-3	1
13	Autotransformer 240 to 120 V	E17A-2-1	1
*14	Blower Wheel	M10-A71	1
*15	Dial Thermometer	CO1A-5	1
*16	Door Hinge	MO1-B5	3
*17	Door Latch - outer	MO2-D2	1
*18	Door Gasket	MO5-A1-108	1
*19	Shelves, nickel plt. w/brackets	MO4-A206	2
24	OTP Reset Device	CO3C-4-1	1
25	Resistor, 3 Kohm	E03A-5-6	1
*	Door Gasket - Inner	MO5-A1-094	1
*	Dial Pointer and Knob	C17D-6	2

OPTIONAL ACCESSORIES

ITEM	DESCRIPTION	PART NUMBER
*20	Stainless steel shelves w/brackets	MO4-A106
21	1 Day Program Timer	C12A-1
	7 Day Program Timer	C12A-3
22	Timer Motor Switch	E16A-7
23	Timer Autoformer 240 to 120 V	E17A-2-1

*ITEMS NOT SHOWN ON WIRING DIAGRAM.

PARTS SHIPPED F.O.B. BLUE ISLAND, ILLINOIS. WHEN ORDERING PARTS GIVE MODEL NUMBER, SERIAL NO., OPERATING VOLTAGE, PART NUMBER, AND QUANTITY REQUIRED.



VIII. MAINTENANCE AND SERVICING

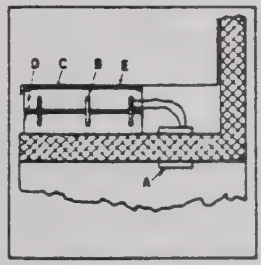
If unit will not heat or a set temperature cannot be maintained, check the following:

1. Check that disconnect switch is on. Also check line fuses.
2. Check all electrical connections for loose or broken wires.
3. Inspect door seal for leaks; door gasket should be replaced periodically, i.e., after several years' service. A tight door seal is important. Check periodically and adjust as required.
4. Inspect heating elements for continuity and deterioration. Remove inner chamber insert and inspect visually. If element needs replacing, refer to replacement parts list for part number. See page 5.
5. If above steps fail to place oven back into operation, please contact nearest Blue M Sales & Service office or factory for assistance.

Remove all power from unit before making adjustments. Time delay resistor is mounted behind reset device. Delay is set at the factory. If adjustment is needed, move the resistor away from reset device to increase time delay; closer to reset device to decrease time delay.

IX. TO REPLACE ELEMENTS ON MODEL ESP-400BC-4 PROCEED AS FOLLOWS:

1. Disconnect element leads on bottom terminal and remove ceramic plate (A).
2. Remove inner chamber (E) to expose element chamber (C). Remove chamber cover to expose element (B).
3. Depress element support clip (D) and simultaneously lift element and pull leads through ceramic discs at rear of chamber.
4. Reverse procedure for installation of element.



BLUE M

BLUE M Electric Company

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MANUFACTURERS AND ORIGINAL DESIGNERS OF CONSTANT TEMPERATURE CONTROLLED EQUIPMENT

CALIBRATING INSTRUCTIONS FOR BLUE M READY-READ TEMPERATURE INDICATOR

The Ready-Read Temperature Indicator is actuated by a liquid-filled thermal system employing a high torque bourdon spiral. There are no gears, hair springs, pinions or multiplying mechanisms to detract from its ruggedness and reliability. The dial arc is a full 270° on a 3" diameter scale and indicator accuracy is ± 2%.

The Ready-Read Thermometer eliminates the irritation and expense of broken glass thermometers. In our judgement, it is more accurate than most small dial thermometers and more convenient than pyrometers with thermocouples. Temperature graduations are easily read and are in both Centigrade and Fahrenheit.

The following instructions explain the use and calibration of Ready-Read Thermometers. In addition, pertinent background information on the liquid-filled thermal system is given.

GENERAL INFORMATION

BASIC READY-READ THERMAL SYSTEM

The basic Ready-Read thermal system is shown in Figure 1. The entire system is filled with a liquid that expands with an increase in temperature. The sensing bulb is a fine bore tubing immersed in the work chamber to measure the temperature. The capillary is also a fine bore tubing that merely "transmits" pressure changes from the sensing bulb to the "Bourdon tube". The Bourdon tube converts pressure changes into rotary motion, thus providing indication on the calibrated scale.

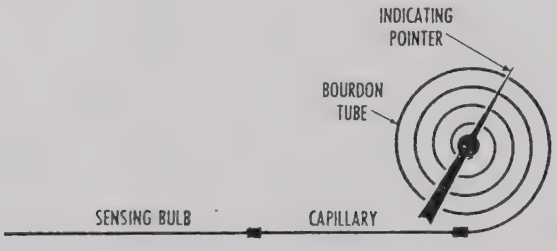


FIG. 1

AMBIENT TEMPERATURE INDICATION AND COMPENSATION

DO NOT ADJUST AMBIENT INDICATION WHEN UNIT IS FIRST RECEIVED AND INSTALLED REGARDLESS OF POINTER INDICATION.

The Ready-Read Temperature Indicator is installed on the unit and then calibrated after the unit has operated for at least one (1) hour. This procedure compensates for ambient rise within the control compartment due to normal heating of electrical components (motors, coils, saturable reactors, etc.). Since the Ready-Read is calibrated with the capillary exposed to relatively high control compartment temperatures, ambient indication will be lower than true ambient until the unit has operated for at least one (1) hour.

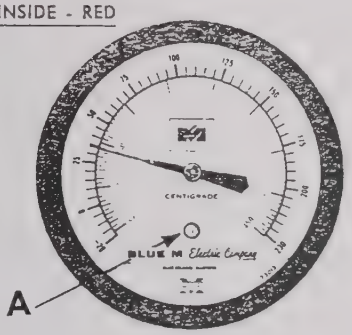
NOTE: Because the Ready-Read Temperature Indicator is not a "total immersion" temperature measuring device, it cannot be used to indicate varying "room" temperatures. Only the sensing bulb must be immersed in the medium to be measured.

The Ready-Read Temperature Indicator automatically compensates for ambient temperature variations experienced at the "case". Compensation is accomplished by a built-in bimetal opposing the rotation of the Bourdon tube.

CALIBRATION

Attach thermocouple of calibrating instrument directly to the Ready-Read sensing bulb. Turn unit "on" and allow to operate for one (1) hour at its lowest controllable temperature. NOTE: For units having sub-ambient temperature capabilities, use ambient for the zero adjustment.

CENTIGRADE - OUTSIDE - BLACK
FAHRENHEIT - INSIDE - RED



ZERO ADJUSTMENT

1. Remove "Bezel" and glass cover from Ready-Read Temperature Indicator. Removal made by prying outward with a small screwdriver, etc., around the perimeter of the chrome plated ring.
2. Rotate adjusting screw "A" until the indicated temperature corresponds to the temperature shown by the calibrating instrument.
3. The zero adjustment is now complete.

SPAN ADJUSTMENT

1. Set unit for an operating temperature near maximum. (If unit maximum temperature is +343°C., set for +300°C. If maximum is +200°C., set for +200°C., etc.)

NOTE: For units having sub-ambient temperature capabilities, the span adjustment may be made on either side of ambient temperature. If greater accuracy is desired at low temperature, set unit for an operating temperature near its minimum. (If unit minimum temperature is —100°F., set for —100°F. If minimum is —40°F., set for—40°F., etc.)

2. Allow unit to operate at this high temperature for one (1) hour.

3. If the temperature shown on the Ready-Read Temperature Indicator is lower than the temperature shown on the calibrating instrument, the "span" is too short.
   Correct by pushing sensing bulb farther into the work chamber.

4. If the temperature shown on the Ready-Read Temperature Indicator is higher than the temperature shown on the calibrating instrument, the "span" is too long.

   Correct by pulling the sensing bulb farther out of the work chamber.

   Adjust the sensing bulb, in or out as required, approximately $1/2$". Allow 10 to 15 minutes for the Ready-Read Temperature Indicator to stabilize. Continue this procedure until the Ready-Read indicates the correct temperature in accordance with calibrating instrument.

The span is now properly adjusted. Reseal into position with a high temperature material such as General Electric RTV Sealant.

NOTE: Changing the immersion depth has a marked effect on temperature indication at the high end of the scale. However, at the low end the effect is negligible. Referring to Figure 2, this is easy to understand.

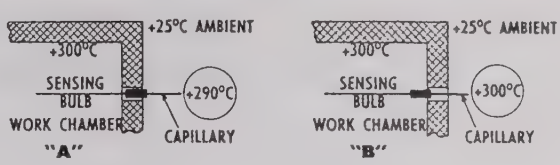


FIG. 2

At a temperature of +200°C. or +300°C., additional immersion exposes more of the sensing bulb to this high temperature. Indication therefore increases. At a low temperature (+25°C.), additional immersion accomplishes nothing, since the chamber's temperature and ambient temperature are the same.

BLUE M

BLUE M Electric Company CORPORATE HEADQUARTERS: BLUE ISLAND, ILLINOIS 60406

MANUFACTURERS AND ORIGINAL DESIGNERS OF CONSTANT TEMPERATURE CONTROLLED EQUIPMENT

INSTRUCTION NO. I-206-1

BLUE-M DIRECT LINE MAX-SET
OVERTEMPERATURE PROTECTION SYSTEM (OTP)

I. INTRODUCTION

The Blue-M Max-Set OTP System represents a great step forward in solving the problems associated with excess temperature cutoff devices. The system includes a liquid filled temperature control, an external time delay and a reset circuit. Primary improvements over other OTP systems are:

A. Nuisance tripping is eliminated almost entirely, even when OTP setting is very close to operating temperature.

B. Manual reset is not required after power interruption.

II. CALIBRATION

The Max-Set OTP is supplied with a dial graduated in reference numbers or degrees (°F or °C). If reference numbers, proceed as follows. Each number represents approximately 20°F (10°C). When calibrating OTP, merely turn OTP knob fully clockwise until unit has stabilized at desired set-point temperature. This normally requires no less than one hour's time. Slowly rotate OTP knob counter-clockwise until main pilot light and/or heat pilot light goes out. Make note at which reference number this happens, and rotate knob clockwise one additional number. Pilot light(s) will again go on and unit should now be ready for operation. If dial is calibrated in degrees, the above procedure is also followed with the one exception that temperature can be set directly rather than interpreting the reference numbers. Refer to enclosed instructions for use of Memory Ring.

III. OPERATION

A. Turn on Main Switch, Circuit Breaker, etc.

B. Press Red "Reset" Button.

C. Set Temperature Control to desired operating temperature.

D. Set OTP Control as described above.

Unit should now be in operation.

If, for any reason, temperature rises above desired setpoint, and opens OTP Control, unit will shut down. As unit cools, OTP Control will again close applying power to unit. This may happen one or more times depending on the adjustment of the time delay. If unit overheats repeatedly, the OTP Control will trip shutting unit down, and requiring a manual restart. After cause of overtemperature condition has been determined and corrected, press OTP Reset Button to restart unit.

IV. MAINTENANCE

1. Occasionally turn OTP Control down to setpoint temperature, deliberately tripping it to verify proper operation.

2. If problem should exist, check OTP Thermostat. Contacts should be closed when control is above setpoint temperature and open when below setpoint temperature.

3. Check Time Delay Resistor and Manual Reset Thermostat. Manual Reset Thermostat is a heat sensitive device which relies on the heat from the Time Delay Resistor to activate it. If the resistor is set too close, thermostat will not trip very rapidly; if too far, thermostat will not rip at all. Proper resistor spacing is 1/16" minimum, and 1/8" maximum from back of thermostat.

MANUFACTURERS AND ORIGINAL DESIGNERS OF CONSTANT TEMPERATURE CONTROLLED EQUIPMENT.

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TEXAS - GARLAND
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WASHINGTON SEATTLE
5501 4th Avenue, South 98108

DIAL LOCKS: There are two dial locks utilized on Blue M temperature control units. One is fixed below the center of dial, figure 2, and one has a two position dial lock as shown in figure 1. The movable lock allows 370° rotation of dial.

To lock dial with two position lock, swing it as far to the left or right as possible and push it up towards center of dial until dial is engaged. Tighten thumbscrew to hold dial in position. When thumbscrew is released, lock will fall away from dial.

To engage fixed lock as shown in figure 2, turn thumbscrew clockwise to lock dial; counterclockwise to release it.

RECALIBRATING CONTROL DIALS

Recalibration should only be necessary after replacing a component in control systems, after extended heavy usage, or if desired temperature cannot be accommodated within pointer window. ALWAYS use an independent temperature indicator of known accuracy when recalibrating dial.

To recalibrate control unit with movable lock, (also identifiable by screw in the middle of the pointer knob), proceed as follows:

1. With unit operating, set pointer index mark to some mid-scale temperature.
2. Lock dial securely.
3. Allow unit to stabilize (approximately 1 hour without temperature change).
4. Loosen the pointer locking screw in center of knob, and loosen two knob set screws (see figure 1). Loosen dial lock. Dial should now rotate independently of the knob and shaft. Note: it may be necessary to pull knob forward slightly to free dial.
5. Turn dial to align pointer index mark with actual temperature within chamber.
6. Tighten dial lock.
7. While holding pointer knob firmly, tighten pointer locking screw, then two set screws.
8. Allow unit to operate 15 minutes, and re-check temperature to be sure that setting was not disturbed during calibration. If setting was changed, allow unit to stabilize and repeat entire procedure.
9. Check reference marks on Memory Ring for accuracy. If necessary, remove marks and follow procedure outlined under "Using the Memory Ring and Reference Numbers."

To recalibrate unit with fixed lock (also identifiable by lack of a screw in center of pointer knob), proceed as follows:

1. With unit operating, set pointer index mark to some mid-scale temperature, and lock dial.
2. Allow unit to stabilize (approximately 1 hour without temperature change.)
3. Loosen set screws sufficiently to allow knob and dial to rotate independently of shaft.
4. Loosen dial lock.
5. Rotate dial on shaft until the pointer index mark is aligned with actual temperature within chamber.
6. Tighten dial lock.
7. Tighten set screws in pointer knob.
8. Allow the unit to operate 15 minutes and re-check temperature to be sure that setting was not disturbed during calibration. If setting was changed, allow unit to stabilize and repeat entire procedure.
9. Check reference marks on Memory Ring for accuracy. If necessary, remove marks and follow procedure outlined under "Using the Memory Ring and Reference Numbers".

OPERATION OF BLUE M OTP SYSTEMS WITH MEMORY RING DIAL

Operation and Maintenance of Blue M's Overtemperature Protection Systems (OTP) are basically the same as for the temperature control systems supplied with the Memory Ring Dial, with the following differences:

OPERATION

1. With the unit operating, loosen the dial lock (see figure 1).
2. Set the OTP control index pointer to a point approximately 5° to 10°C. (10° to 20°F.) above the desired operating temperature.
3. If "Control Failure" light glows, press reset button.
4. Unit will now operate, with OTP shutting down the unit in the event of an over temperature condition.

Calibration of the unit is the same as that of the temperature control systems, with the following differences:

1. Loosen the dial lock and turn OTP control knob fully clockwise; operate unit until it stabilizes at desired temperature, +175°C., in this case. (see figure 1).
2. Turn OTP control down (counterclockwise) until the OTP trips and shuts down unit, sounding buzzer.
3. Observe the reference number that is lined up with +175°C., and proceed by following the instructions outlined in "Using the Memory Ring and Reference Numbers" section of this manual, starting with number 7.

BLUE M
A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406

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INSTRUCTION NO. I-301-13-R1

OPERATION AND CALIBRATION OF BLUE M MEMORY RING® DIAL SYSTEM

Blue M's patented Memory Ring Dial System is supplied with many Blue M temperature control systems. The Memory Ring allows accurate and repeatable temperature settings throughout range of unit. All dials are factory calibrated to commercially acceptable standards.

NOTE: This is a dual scale dial. Care must be taken to read the correct scale when selecting operating temperature.

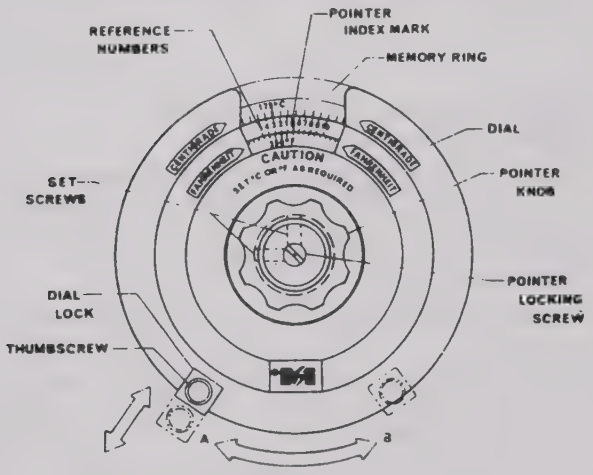

Figure 1

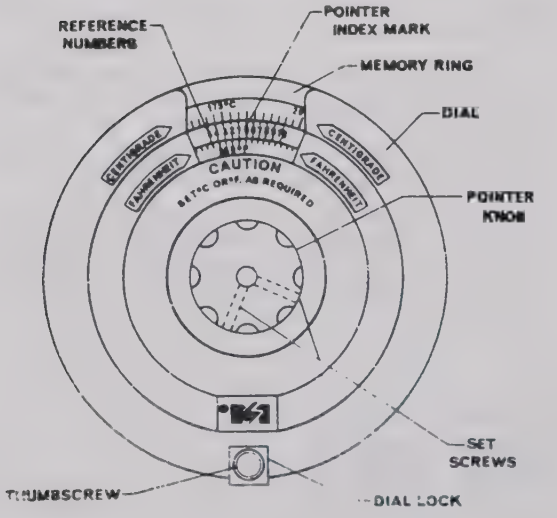

Figure 2

USING THE MEMORY RING AND REFERENCE NUMBERS:

1. Turn unit ON according to basic unit instructions.
2. Unlock dial (refer to Dial Lock Section), and rotate knob until pointer index mark is aligned with desired temperature, +175°C. in this case. Refer to figures 1 and 2.
3. Allow unit to stabilize (approximately 1 hour without temperature change, as measured by an independent temperature indicator of known accuracy).
4. If temperature measured within chamber does not agree with dial setting, rotate pointer knob slightly in desired direction to bring unit to required temperature.

NOTE: Rotate knob CLOCKWISE to INCREASE temperature; rotate COUNTERCLOCKWISE to DECREASE temperature.

5. Allow unit to stabilize (approximately 15 minutes).
6. Repeat steps 4 and 5 until unit stabilizes at exactly +175°C.
7. Note which reference number is lined up with +175°C. Assume that the number 3 lines up in this example. Refer to figure 3.

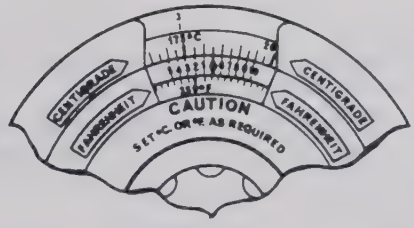

Figure 3

8. Using a pencil or ball-point pen, make a small mark on Memory Ring above +175° C, mark, and write correction number "3" above mark.
9. In future, when control is turned to +175°C., the correction number 3 will appear in pointer window. It will coincide with number 3 on dial pointer and indicate proper setting for +175°C.
10. All temperatures may be calibrated in the same manner. The dial may be calibrated in normal use by marking a correction number when proper temperature is reached.

NOTE: If any desired temperature setting cannot be accommodated in pointer window, recalibration of control dial may be required.

BLUE M

BLUE M *Electric Company*

Corporate Headquarters: BLUE ISLAND, ILLINOIS 60406

MODEL NUMBER: ESP-400BC-4 (Y)
VOLTAGE 208V/240V/1PH/60HZ (50HZ)
MAX. TEMPERATURE 260°C. (500° F.)
MAX. WATTS 3.8KW , 2.8KW
INTERIOR DIMENSIONS: 19W X 15D X 18H

PWD-834-85H

PARTS NOT SHOWN
*OPTIONAL ACCESSORIES

Parts shipped F. O. B Blue Island, Illinois. -- When ordering parts, give Model No., Serial No., Voltage and Part No.

ITEM	DESCRIPTION	PART NUMBERS	REQ'D.
1	POM-70 Temperature Control	C03B-3-11	1
2	Temperature Sensor	C11D-4-1	1
3	Setpoint Potentiometer	C16A-1	1
4	Voltmeter with Resistor	E09-3	1
5	Pilot Light - RED	E06B-2	1
6	Toggle Switch - MAIN	E16A-1	1
7	Fused Disconnect Switch	E16G-10	1
8	Fuse 25 AMP	E04C-25	2
9	Overtemperature Protection Control	C03A-6-3	1
10	Heating Element 15.2 ohms	H4-105-8-3/4	1
11	Blower Motor (50HZ USE E10A-2-7)	E10A-2-5	1
12	Elasped Time Meter (50HZ USE C12G-4)	C12G-3	1
13	Autotransformer 240V TO 120V	E17A-2-1	1
* 14	Blower Wheel	M10-A71	1
* 15	Dial Thermometer	C01A-5	1
* 16	Door Hinge	M01-B5	3
* 17	Door Latch	M02-D2	1
* 18	Door Gasket	M05-A1-108	2
* 19	Shelves, Nickel Plt. W/Brackets	M04-A206	2
* 20	Stainless Steel Shelves, W/Brackets	M04-A106	
* 21	1 Day Program Timer, 7 Day Program Timer	C12A-1 / C12A-3	
* 22	Timer Motor Switch	E16A-1	1
* 23	Timer Autoformer 240V TO 120V	E17A-2-1	
24	OTP Reset Device	C03C-4-1	1
25	Resistor, 3000ohms	E03A-5-6	1
* 26	BLOWER SHAFT (50HZ UNITS ONLY)	M06-G3-3	1
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L1 = 18 AMP
L2 = 15 AMP

CAUTION!

TO AVOID DAMAGE, THIS INSTALLATION ADJUSTMENT INSTRUCTION MUST BE FOLLOWED CAREFULLY.

INSTALLATION ADJUSTMENT

This unit is designed to operate from a wide range of power input voltages. To provide optimum internal control circuit operation, the secondary of the control circuit transformer (located on tray behind control panel) is provided with several adjustable taps and a double wound primary coil. Installing electrician must verify that this transformer has been connected for your actual power input voltage.

The transformer primary (Terminals H1, H2, H3 and H4) are connected for either 208-240 volts or 380-480 volts. These connections should not be changed as correction of such magnitude would also require power component replacement (heaters, motors, fuses and even wiring).

The transformer secondary (terminals X1, X0, X2 and X3) can and should be adjusted to provide a control operating voltage of 110 to 120 volts on 60 hertz units or 100 to 110 volts on 50 hertz units. Transformer terminal X1 is grounded to act as control circuit neutral and should not be changed, but wire connected to terminal X0, X2, or X3 can be moved to provide the control voltage closest to that listed above. Table on wiring diagram shows usual voltage connection, but it is recommended that an actual measurement of control circuit voltage be made at time of installation and tap adjustments be made to bring control voltage to above optimum value.

NOTE: NOT ALL TRANSFORMERS INCLUDE THE X0 TAP.

NOTICE - CAUTION

BLUE-M BELIEVES THIS INFORMATION IS CORRECT FOR YOUR EQUIPMENT AS IT WAS ORIGINALLY SUPPLIED BY US. SAFETY REQUIREMENTS ARE CHANGING CONTINUOUSLY. YOUR EQUIPMENT MAY NO LONGER MEET CURRENT SAFETY REQUIREMENTS. BLUE-M CANNOT BE RESPONSIBLE FOR CHANGES MADE BY YOU, OTHER USERS OR OWNERS.

WS/AA/LV: 5/16/86

BLUE M

A UNIT OF GENERAL SIGNAL

HAZARD

THIS UNIT IS NOT INTENDED FOR USE IN PROCESSING HAZARDOUS WORK LOADS. FATAL INJURIES AND PROPERTY DAMAGE CAN RESULT FROM PROCESSING COMBUSTIBLE VOLATILE FLUIDS OR MATERIALS WHICH EMIT EXPLOSIVE VAPORS.

Consult with your safety engineering staff before processing questionable loads in this unit.

Blue M designs and manufactures other equipment for processing hazardous materials.

CAUTION FOR UNITS WITH OTP ONLY!

If this unit is equipped with OTP, overtemperature protection circuitry, then unit must be checked once a month to ensure it is performing according to design parameters.

TO TEST: Run operating temperature of chamber without a product load to a value above the OTP trip point, usually a value ten degrees above unit's normal maximum operating temperature. Lowering trip point to the temperature setpoint to create an alarm condition is NOT a valid test.

When plenum temperature reaches the OTP setpoint, chamber should shut down and cease operating if the OTP circuit is functioning properly.

After testing, chamber can be returned to normal operation by pressing the OTP reset button.

Refer to your unit's OPERATING AND MAINTENANCE Instruction for detailed information.

DANGER!

TO ENSURE PROPER OPERATION OF UNIT AND FOR SAFETY, MAKE SURE THAT UNIT IS LEVEL WHEN INSTALLED. DOOR(S) MAY SWING SHUT ON PERSONNEL IF UNIT IS TILTED!

THIS PRODUCT IS BUILT WITH DESIGNED-IN SAFETY FEATURES. ANY UNAUTHORIZED MODIFICATIONS OR COMPONENT CHANGES TO THIS UNIT COULD RESULT IN CONDITIONS LEADING TO PERSONAL INJURIES, PROPERTY DAMAGE, AND FATALITIES!

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BLUE M

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REPLACEMENT INSTRUCTION NOTICE

This operating manual, wiring diagram and parts list is being supplied by Blue M / A unit of General Signal. We believe this information to be the same as supplied with equipment when it was shipped by us.

A. There may be some Instrumentation Manuals missing for obsolete or special instruments used on this equipment. Blue M no longer has these manuals and you should obtain them from the Instrument Manufacturers.

B. The part numbers shown on the parts list may still be current or they may have been changed to our new parts numbering system. Parts ordered with the old numbers will be converted to the new numbers when your order is received. We cannot guarantee that all parts are available for all units. Substitutes will be supplied when these are available.

C. BLUE M CANNOT BE RESPONSIBLE FOR ANY MODIFICATIONS OR CHANGES MADE BY YOU OR OTHERS USING THIS EQUIPMENT.

D. If you should have any questions or doubts as to the operation or suitability of this or any other Blue M unit to perform a specific application, we suggest you contact your nearest Blue M Office for an inspection call.

E. Blue M equipment is designed and manufactured to the safety standards required for the particular piece of equipment as they applied to the equipment at the time it was manufactured. These standards have changed over the years and it is quite possible that the equipment you have will no longer meet these standards.

WS/RH: 12/8/88

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